

What is claimed is:

1. A nanocomposite electrolyte membrane for a fuel cell, comprising:
 - a polymer having cation exchange groups; and
 - silicate nanoparticles dispersed in the polymer, the silicate nanoparticles having a layered structure, and the silicate nanoparticles being intercalated with the polymer, or layers of the silicate nanoparticles being exfoliated.
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2. The nanocomposite electrolyte membrane of claim 1, wherein the silicate is selected from the group consisting of smectite, vermiculite, halloysite, sericite, mica, and a mixture of the forgoing materials.
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3. The nanocomposite electrolyte membrane of claim 2, wherein the smectite is selected from the group consisting of montmorillonite, saponite, beidellite, nontronite, hectorite, stevensite, and a mixture of the forgoing materials.
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4. The nanocomposite electrolyte membrane of claim 1, wherein the silicate nanoparticles have an average diameter of 1-100 nm.
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5. The nanocomposite electrolyte membrane of claim 1, wherein the amount of the silicate nanoparticles is in a range of 1-30% based on the total weight of the nanocomposite electrolyte membrane.
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6. The nanocomposite electrolyte membrane of claim 1, wherein the cation exchange groups of the polymer are selected from the group consisting of a sulfonate acid group, a carboxyl group, a phosphoric acid group, an imide group, a sulfonimide group, a sulfonamide group, and a hydroxyl group.
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7. The nanocomposite electrolyte membrane of claim 1, wherein the polymer with cation exchange groups is a homopolymer or a copolymer of trifluoroethylenes, tetrafluoroethylenes, styrene-divinyl benzenes, α, β, β -trifluorostyrenes, styrenes, imides, sulfones, phosphazenes, etherether ketones, ethylene oxides, polyphenylene sulfides, or aromatic groups, or a derivative of the homopolymers and the copolymers, or a mixture of the forgoing materials.

8. The nanocomposite electrolyte membrane of claim 1, wherein the polymer is a highly fluorinated polymer with sulfonate groups as proton exchange groups at the terminals of side chains and containing fluorine atoms that amount to at least 90% of the total number of fluorine and hydrogen atoms bound to carbon atoms of the backbone and side chains of the polymer.

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9. The nanocomposite electrolyte membrane of claim 1, having a thickness of 30-200 μ m.

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10. A fuel cell comprising:
a cathode where a reduction of an oxidizing agent occurs;
an anode where an oxidation of fuel occurs; and
the nanocomposite electrolyte membrane according to any one of claims 1 through 9 interposed between the cathode and the anode.

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11. The fuel cell of claim 10, wherein the cathode comprises a catalyst layer containing carbon supported platinum catalyst.

12. The fuel cell of claim 10, wherein the anode comprises a catalyst layer containing carbon supported platinum catalyst.

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13. The fuel cell of claim 10, wherein the anode comprises a catalyst layer containing carbon supported platinum-ruthenium catalyst.

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